CLAIMS

1) Method of multiplexing in a multiplexer a plurality of data streams to a single channel each of said data streams containing a plurality of fixed lengh data packets being serially transmitted from a source to a destination by way of the data stream and the channel, the method comprising:

for each data stream:

a) receiving a data packet at an input of a data stream;

b) segmenting the data packet into segments;

c) assigning a time label to the data packet, the time label containing data indicating an estimated arrival time for the packet at the multiplexer;

d) transmitting the time label to the multiplexer at a first signal from the multiplexer;

e) transmitting the segments comprising the data packet to the channel at a second signal from the multiplexer; and

f) storing the time label as a previously transmitted stream time label;

for the multiplexer:

aa) signalling a data stream to transmit a time label by sending the first signal;

bb) receiving a received time label from a data stream, the received time label being associated with the data stream transmitting the received time label;

cc) storing the received time label in a group of received time labels the group of time labels containing received time labels from other data streams;

dd) sorting the group of received time labels to determine a transmitting time label with an earliest estimated arrival time of the group;

ee) sending a second signal to the data stream associated with the transmitting time label to transmit the segments comprising a transmitting data packet to the channel, said transmitting data packet being a data packet assigned with the transmitting time label;

ff) storing the transmitting time label as a previously transmitted channel time label; and

gg) removing the transmitting time label from the group after the segments comprising the transmitting data packet have been transmitted.

2) Method as claimed in claim 1 wherein step c) further includes:

c1) storing the data packet in a FIFO (first in, first out) stream queue, the stream queue having a front end and containing previously received data packets, the stream

queue also having a front data packet being a data packet at the front of the stream queue;

c2) calculating the estimated arrival time for the data packet at the destination of the data packet

5 c3) choosing the time label for the data packet based on a condition chosen from the group comprising:

- if the group is not empty, the later of:

c31) the estimated arrival time of the data packet; and

c32) the time label of the packet currently transmitted; if the group is

10 empty, the later of:

c3a) the estimated arrival time of the data packet and

c3b) the previously transmitted channel time label.

3) Method as claimed in claim 2 wherein step c2) further includes calculating the estimated arrival time for the data packet at the multiplexer of the data packet by

15 cumulatively adding for every segment produced from the data packet a predetermined minimum inter-segment time to a segment time counter, the segment time counter initially having a value equal to the estimated arrival time for the previous data packet, the previous data packet being

- a previously received data packet and

20 - received by the data stream immediately preceding the data packet.

4) Method as claimed in claim 1 wherein step b) further includes serially storing the data packet segments in a segment list.

5) Method as claimed in claim 1 wherein step cc) includes storing the group in a priority queue.

25 6) Method as claimed in claim 5 wherein in the priority queue has a binary sort tree structure.

7) Method as claimed in claim 6 wherein the priority queue is stored in an array.

8) Method as claimed in claim 1 wherein step dd) further includes comparing the received time labels to determine the transmitting time label.

30 9) Method as claimed in claim 8 wherein, if a time gap between the transmitting time label and the previously transmitted stream time label of a lapsed data stream is greater than a predetermined value, a next data packet from that lapsed data stream is assigned a time label equal to the transmitting time label in use when the next data packet is segmented.
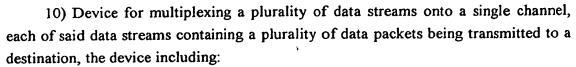
10) Device for multiplexing a plurality of data streams onto a single channel, each of said data streams containing a plurality of data packets being transmitted to a destination, the device including:

5   receiving means for receiving the data packets from the plurality of data streams;

buffering memory means for each data stream for serially buffering received data packets;

processor means for:

        a) measuring:

10   a size of the segments; and

                a size of the packets;

        b) calculating and assigning a time label to each data packet, said time label containing data indicating an estimated arrival time for each packet at the multiplexing device;

15   c) comparing time labels of data packets to determine a transmitting time label having an earliest estimated arrival time of the data packets;

        d) segmenting each received data packet into segments;

transmission means for transmitting to the single channel the segments comprising the data packet assigned the transmitting time label having the earliest estimated arrival time;

20   gating means for controlling the transmission of data packets from the buffering memory means to the processing means;

time label buffer memory means for storing time labels assigned to the data packets; and

25   segment buffer memory means for temporarily storing the segments;

wherein

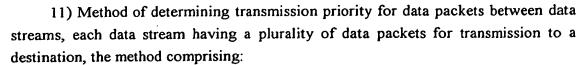the processor means is coupled to:

        the segment buffer memory means;

        the transmission means;

30   the gating means; and

        the time label buffer memory means;

the buffering memory means is coupled between the receive means and the gating means.

11) Method of determining transmission priority for data packets between data streams, each data stream having a plurality of data packets for transmission to a destination, the method comprising:

a) for each data stream:

5   aa) serially arranging the data packets into a stream queue having a front;

ab) assigning a time label to each data packet, said time label containing data indicating an estimated arrival time for said data packet at a segmentation and multiplexing device;

ac) sending the time label of a front data packet to a priority queue
10   containing other time labels of other front data packets, a front data packet being the data packet at the front of a stream queue;

ad) associating the time label of the front data packet with the data stream which contains the front data packet assigned to the said time label;

b) determining which time label in the priority queue has an earliest estimated
15   arrival time;

c) giving transmission priority to the data stream associated with the time label having the earliest estimated arrival time, said transmission priority being for transmitting the front data packet assigned to the time label having the earliest estimated arrival time.

20   12) Device for multiplexing a plurality of data streams onto a single channel, each of said data streams containing a plurality of data packets being transmitted to a destination, the device including:

receiving means for :

a) receiving and segmenting the data packets into segments, said data
25   packets being received from the plurality of data streams;

b) measuring:

a size of the segments; and

a size of the packets;

c) calculating and assigning a time label to each data packet, said time
30   label containing data indicating an estimated arrival time for each packet at the device;

segment buffer memory means for temporarily storing the segments;

processor means for comparing time labels of data packets to determine a transmitting time label having an earliest estimated arrival time of the data packets;

transmission means for transmitting to the single channel the segments comprising the data packet assigned the transmitting time label having the earliest estimated arrival time;

gating means for controlling the transmission of data packets from the segment buffer memory means to the processing means;

5

time label buffer memory means for storing time labels assigned to the data packets; and

wherein

the processor means is coupled to the transmission means;

10   the gating means is coupled between the processing means and
- the segment buffer memory means and
- the time label buffer memory means; and

the receiving means is coupled to the segment buffer memory means and the time label buffer memory means.